Vital Signs for Economic Development

Washington Economic Development Commission

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The **WASHINGTON ECONOMIC DEVELOPMENT COMMISSION** is an independent, non-partisan commission charged by the Legislature with the mission of creating a comprehensive statewide strategy to guide investments in economic development, infrastructure, workforce training, small business assistance, technology transfer, and export assistance. The WEDC membership comprises business, labor, academic, and association and government leaders. In carrying out this legislative mandate and related responsibilities the WEDC will:

- Provide leadership, guidance and direction to the Governor and Legislature on a long term and systematic approach to economic development.
- Formulate a common set of outcomes and benchmarks for the economic development system as a whole and measure the state's economic vitality.
- Define public, private and philanthropic sector roles and best practices ensuring Washington captures the next generation of technology investment and global market opportunities.
- Provide a forum for geographic and industry cluster "institutions for collaboration" to build stronger partnerships.

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I. Introduction

Metrics are important because they allow us to track, assess, and adjust an economic development strategy given a set of measurable outcomes. In this report, we focus on those outcomes that are measurable and we believe reflect improvements in the economic well-being of Washingtonians. The metrics reviewed in this benchmarking report are not perfect descriptors of Washington's wellbeing, but closely approximate changes in the state economy in areas important for growing and sustained economic development—changes in business performance, jobs, and income. We then evaluate how Washington has performed across a set of measures that allow for comparison against other states, and we fell are relatively meaningful. Washington has long been strong in the supply of skilled workers, international connectivity through exports, and innovation as measured by patenting activity and R&D investments. However, to what extent are these intermediate outcomes the result of state policy, versus "random events" delinked from policy choices?

How has Washington Performed?

A common theme throughout these metrics is that Washington has not sufficiently grown the local stock of necessary inputs. Much of our state's success owes to the growth of local businesses and the attractiveness of our region for entrepreneurs and skilled workers. We are highly concentrated in STEM-based occupations and skilled workers, but only a fraction of these workers received the training they needed from Washington-based institutions. **Section III** summarizes the key findings from this report.

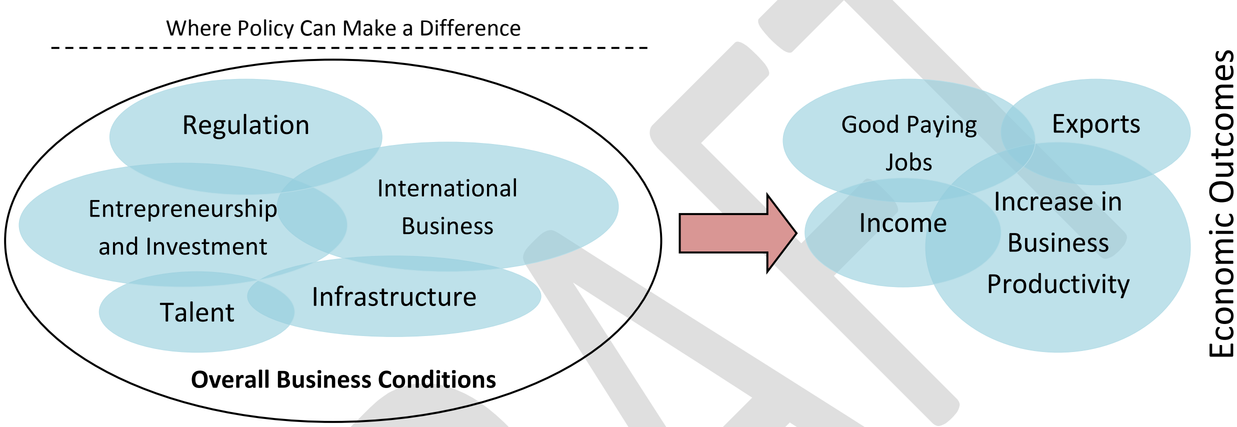
Next Steps

In order to move forward with the Washington Economic Development Commission (WEDC) strategy for growing the state economy, metrics need to be tracked periodically to assess how the state is performing. Currently, in addition to the WEDC metrics reported in this report, each December the Economic and Revenue Forecast Council publishes its annual "Climate Study," while each year the Washington State Department of Commerce reports to the Legislature and Governor on how the state is performing across a set of national rankings. **These efforts should be combined to produce one, jointly researched and published report on Washington's economic performance**. Vesting the responsibility for metrics reporting in a single agency assures quality, timeliness, and accessibility of all data deemed useful. The data should be presented as both an annual report for use by legislatures, but also via an online tool that is periodically updated based on when new data is made available. Such a tool will help policymakers track state economic performance and propose necessary adjustments.

II. Framework

The Washington Economic Development Commission (WEDC) believes these outcomes are a function of performance across five key areas of economic activity, or what we refer to as "pillars," those of: 1) talent and workforce; 2) entrepreneurship and small business; 3) international business; 4) infrastructure; and 5) regulatory system. Simply put, when Washington improves each of these five areas, economic growth follows. Our economic development strategy follows the model of economic development below (**Figure 1**):

Figure 1. Framework for Benchmarking Washington's Economic Performance



If Washington gets the "fundamentals right," the WEDC believes the broader economic outcomes that lead to economic wellbeing of Washingtonians will also improve. However, these fundamental are shaped by a variety of factors, entailing more than one policy choice. For instance, the stock of available human capital—measured, for instance, by the number of STEM-trained workers in Washington—can be a function of both our education system's ability to train individuals at the secondary and post-secondary levels in core STEM fields, but also our state's ability to attract skilled workers from elsewhere.

III. Summary of High Level Metrics

Pillar	Indicator	Metric	Ranking	Latest Data	Data Trend	Description
High Level	Real GDP growth, trend line, ‘00-‘11	2.1%	14	2011	↑	
High Level	Per capita GDP, change 2000-2011	0.8%	25	2011	→	Trend line growth
High Level	Jobs recovery	3.5%	13	Jul-12	↑	Change from non-farm employment nadir since December 2007 to July 2012
High Level	Year-over-year reduction in unemployment rate	0.6 ppts	28	Aug-12	→	
High Level	Change in median household income, 2007-2011	-9.8%	35	2011	↓	
Sector-based Growth	Information & communication technology—employment change	4.3%	1	2011	↑	2007-2011
Sector-based Growth	Manufacturing—employment change	2.4%	2	2011	↑	
Sector-based Growth	Life sciences—employment change	12.2%	1	2011	↑	Among 20 largest states for life sciences in 2007, excluding university research.
Talent and Human Capital	Public school test scores—basic or above in math, 4th grade	84%	24	2011	→	
Talent and Human Capital	Public school test scores—basic or above in math, 8th grade	76%	21	2011	→	
Talent and Human Capital	Public school test scores—basic or above in reading, 4th grade	67%	31	2011	↓	
Talent and Human Capital	Public school test scores—basic or above in reading, 8th grade	77%	26	2011	→	
Talent and Human Capital	Public school test scores—proficient or above in math, 4th grade	45%	13	2011	→	
Talent and Human Capital	Public school test scores—proficient or above in math, 8th grade	40%	12	2011	↑	
Talent and Human Capital	Public school test scores—proficient or above in reading, 4th grade	34%	20	2011	↓	
Talent and Human Capital	Public school test scores—proficient or above in reading, 8th grade	37%	13	2011	↑	
Talent and Human Capital	Percentage of 25-44 year-olds with high school degree or higher	89.9%	25	2011	→	
Talent and Human Capital	Percentage of 25-44 year-olds with bachelor's degree or higher	32.6%	18	2011	→	
Talent and Human Capital	STEM workforce—change in computer and mathematical workers, 2007-2011	16.0%	11	2011	↑	

Talent and Human Capital	STEM workforce—Location Quotient, 2011	1.30	3	2011	→	
Talent and Human Capital	STEM workforce—Average Annual Earnings, 2011	$85,933			↑	
Investing in Entrepreneurship and Small Business	SBIR & STTR awards—awards dollars per $1M in nominal GDP	$139.30	13	2011	→	
Investing in Entrepreneurship and Small Business	Venture capital investment per capita	$79.33	5	2011	↓	
Investing in Entrepreneurship and Small Business	R&D—as percentage of state GDP, among 10 largest recipients overall	5%	6	2008	↑	
Investing in Entrepreneurship and Small Business	Patents—all types, trend line growth 1998-2011	8.8%	1	2011	↑	
Investing in Entrepreneurship and Small Business	Patents—all types per 10,000 residents	7.71	5	2011	↑	
Investing in Entrepreneurship and Small Business	Patents— all types per 10,000 residents, trend line growth, 2000-2011	8.6%	1	2011	↑	
Investing in Entrepreneurship and Small Business	Rate of growth of start-ups, 2006-2010	-34.8%	35	2010	→	
Infrastructure	Percent functional obsolete bridges	20.0%	41	2011	↑	
Infrastructure	Percent structurally deficient bridges	5.0%	6	2011	↑	
Infrastructure	Vehicle miles traveled per capita	8,482	11	2010	→	
Infrastructure	Roads in good or very good condition		16	2011	→	
International Business	Non-aerospace, non-agriculture exports	6.4%	26	2011	↑	Trend line annual per capita growth since 2000
International Business	Jobs in FDI firms as share of total covered employment	4.0%	33	2009	→	

IV. Overall Economic Context

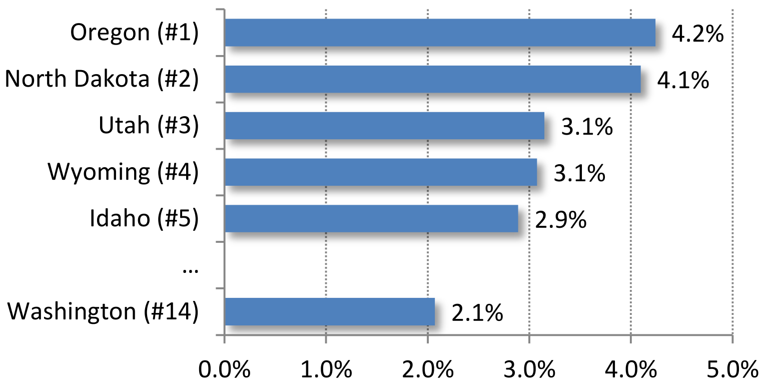
We start by looking at broad measures of Washington's economy before delving into metrics across the Washington Economic Development Commission's ***four pillars*** delineated in the Commission's 2012 economic development strategy.[1] These broad areas include: 1) unemployment and overall job performance; 2) income; and 3) sector-based performance.

We begin by asking the question: "how unique is Washington's experience from national trends"? We look at a variety of outcomes and trends over time in an effort to benchmark these against other states in the U.S., and when possible, other regions of the world. We segment data between top-level and more goal-specific measures. Before proceeding, it's important to emphasize that no single data point or set of data can truly capture the inner workings and performance of a state economic development system. That being said, we feel these measures are the most reliable, validated, and meaningful for evaluating how the state has performed at either tier of analysis. Unless otherwise stated, state rankings include the District of Columbia.

[1] A draft version of the WEDC's strategy is available online at: http://wedc.wa.gov/Download%20files/2012StrategicPlanDraft.pdf.

Real GDP Growth

Figure 1. Real GDP Growth
Trendline, 2000-2011



Why this metric matters? Changes in real GDP (adjusted for inflation) reflect changes in overall economic output in a given economy. While this measure does not capture the distribution of newly created wealth, it does reflect overall, aggregate growth—the enlarging of the "pie."

Data source: U.S. Bureau of Economic Analysis.

How has Washington performed? Washington's real (i.e., adjusted for inflation) gross state product, or "real GSP," grew in absolute terms roughly 1.7% per annum between 2000 and 2011 (24th among all states), or 2.1% trend line growth (14th fastest; **Figure 1**). This compares with an overall U.S. growth rate of 1.4 % per annum or 1.5% trend line growth. Private sector real GDP grew slightly faster over this period, at 1.7% per annum (ranked 23rd) or 2.2% trend line growth (ranked 17th).

In 2011, Washington's ***real per capita GDP*** (inflation-adjusted, chained to 2005 dollars) was $45,520—fifteenth highest in the U.S. Taking the slope of the natural log of real per capita GDP, Washington grew 0.8% per year between 2000 and 2011, good for twenty-fifth fastest in the U.S. (**Figure 2**). Over the 1997 to 2010 period, Washington's fastest growing sectors were in information and data processing services (15.0% trend line), computer systems design and related services (8.3%), and water transportation (6.6%). This compares with overall U.S. trend line growth in real GDP that was strongest in water transportation (9.8%), information and data processing services (9.7%), and funds, trusts and other financial vehicles (8.8%). Within the manufacturing sector (a more detailed unit of analysis), the fastest growing subsectors in Washington over this period were computer and electronic product manufacturing (22.3% growth), followed by machinery manufacturing (7.0%) and petroleum and coal products (6.4%).[2]

Composition of Growth

Between 2007 and 2010 (latest available sectoral data), the largest drivers of real GDP growth in Washington by sector were information, healthcare, all three levels of government, retail trade, and "professional, scientific, and technical services."[3] The information sector—which includes software

[2] Data source: U.S. Bureau of Economic Analysis (BEA).
[3] For real GDP "y" for industry "i" and year "j," for all cases in which $(y_{i,j=2010} - y_{i,j=2007}) > 0$, the contribution of y_i to overall gains in real GDP for Washington, Y, is equal to $(y_{i,j=2010} - y_{i,j=2007}) / \sum_{i=1}^{n} (y_{i,j=2010} - y_{i,j=2007})$ for all $(y_{i,j=2010} - y_{i,j=2007}) > 0$. To calculate for industries with a net drag on real GDP, the opposite cases are used.

publishing and telecommunications—and healthcare were by far the largest drivers, contributing 27.4% and 25.3%, respectively. The biggest drags on growth were construction, responsible for nearly a third of gross output contraction, followed by "real estate and rental and leasing" and wholesale trade (**Figure 3**).

Real output in manufacturing during the 2007-2010 period fell 4.0%, contributing 14.6% of total sector-based declines. However, much of this decline can be attributed to select industries. For instance, real output in non-durable goods actually grew in aggregate 4.1%, though all of this growth came from one subsector—petroleum and coal products manufacturing. Real output in durable goods contracted 7.3%, but the biggest drag was from transportation equipment (a 14.1% decline, responsible for 61.0% of gross declines in durable goods), but recent trends have reversed with the successful delivery of the first Boeing 787s and new aerospace orders now being completed. The largest driver of durable goods output during this period was in computer and electronic product manufacturing, growing 71.9%.

Figure 2. Trend Line Growth in Real per Capita GDP, 2000-2011

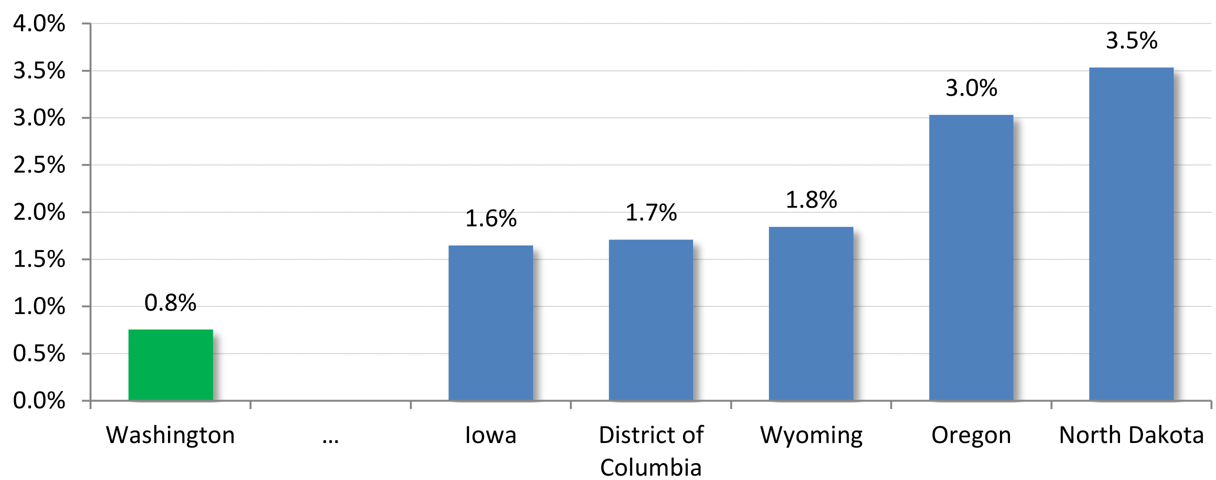
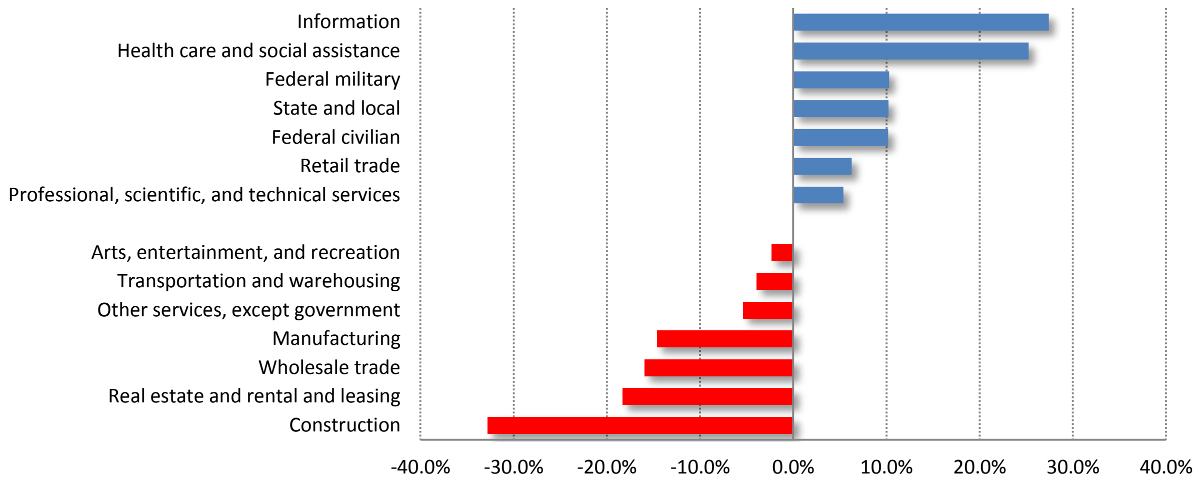
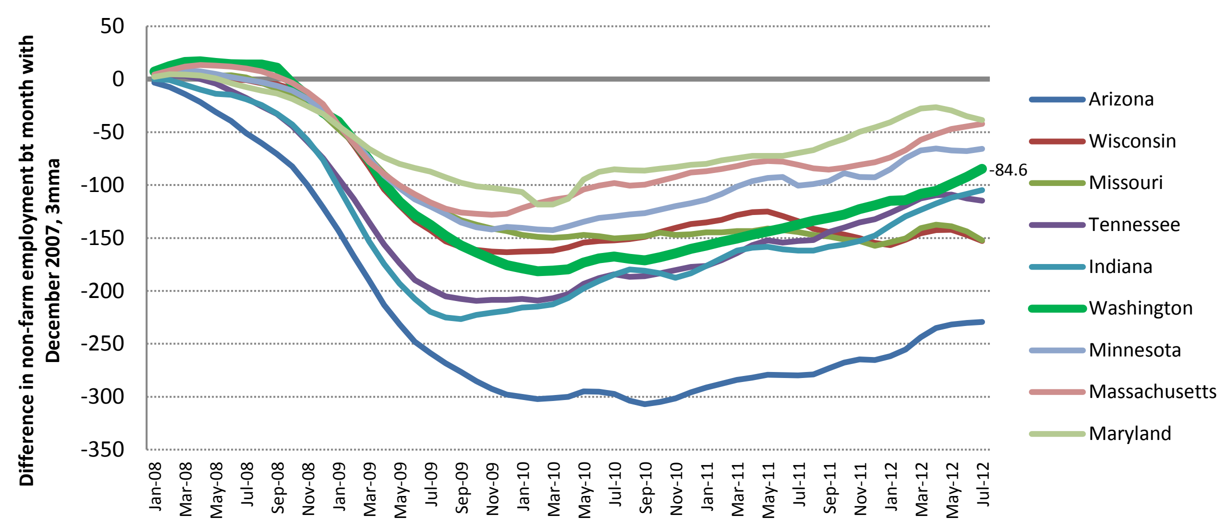


Figure 3. Largest Drivers and Drags on Real GDP, Washington, 2007-2010



Jobs Recovery

Figure 4. Jobs Recoveries for Select States



Why this metric matters? A given state's overall employment recovery may be due to a variety of factors, including the underlying structural composition of the state economy. For instance, region's with a greater than average share of economic activity related to the real estate and construction sectors may reach pre-recession employment levels much slower and later; likewise, regions with regions that have a high degree of international trade may recover more quickly.

Data source: U.S. Bureau of Labor Statistics.

How has Washington performed? Like much of the U.S., Washington's recovery has been slow and anemic, with absolute non-farm employment still well below levels just prior to the 2007 to 2009 recession. Each state in the union experienced an employment "nadir" at different times. For instance, 57% of all states (29 in total) experienced their lowest point (since the onset of the national recession in Q4 2007) in non-farm employment in either February or March of 2010, almost a year after the Bureau of Economic Analysis (BEA) estimated the recession ended, based on measures of quarterly real gross domestic product (GDP). Washington experienced its own low point in February 2010, when non-farm employment (based on a three-month moving average) fell to just 2,775,900 workers, roughly 181,400 workers below employment in December 2007 and 198,300 workers between Washington's recent peak employment in April 2008 and February 2010 (**Figure 4**).

Employment by Sector

Using the Quarterly Census of Employment and Wages (QCEW) dataset, we can look more closely at wage and salary disbursements and employment. However, it's important to note the following limitations with this approach: 1) this data does not capture benefits paid out by employers; 2) it does not capture labor hours of input, precluding labor productivity estimates; 3) following from the former, the data does not differentiate between part-time versus full-time employees; and 4) since the source of the data is through the unemployment insurance system, it does not capture sole proprietorships. With these caveats in mind, we first asses changes in the average in Washington.

Information and communication technology. Washington's information and communication technology (ICT) sector reached a new peak in 2011, with 124,440 workers. This placed Washington as the eighth largest state for ICT employment, but well behind California (548,108), Texas (313,912), and Virginia (200,167). However, among the ten largest states for ICT employment, between 2002 and 2011 Washington was one of only two states with trend-line positive growth, and nearly twice as fast as Virginia (2.4% versus 1.3%). This compares with overall U.S. growth of -0.7% per year (based on the natural log) and -1.6% in California. Within Washington's ICT sector, between 2007 and 2011 the computer systems and design sector added 5,759 jobs, accounting for more than 44% of all subsector-based job increases in ICT; this was followed by the software publishing subsector, which added close to 4,000 jobs. The biggest drag on employment growth in the ICT sector in Washington during this period was the telecom industry, which shed 1,934 jobs, or about 30.4% of all subsector-based job losses.

We also look at to what extent each state has added jobs since its most recent nadir in ICT employment, between the years of 2002 and 2011. In Washington, the ICT's lowest employment level during this period was in 2003, when only 101,610 workers were employed in the sector (completing a contraction that began a few years earlier after the collapse of the dot.com bubble). Since then, Washington's ICT firms have steadily added workers, with 2011 employment showing a gain of 22,830 workers above sector-based employment in 2003 (**Table 1**). Among the top 10 largest ICT employers, only Washington and Virginia experienced employment minimums before 2010 (each during 2003, the rest during 2010 or 2011). Average annual wages in the ICT sector in Washington were second highest in the U.S. in the 2011, behind only California ($120,128 versus $124,905). Washington was at the very bottom among all fifty states in ICT wage growth (2.2% annual trend line growth between 2002 and 2011), but this may in part be due to the already high wages being paid out the sector. More importantly, between 2010 and 2011 the average ICT wage in Washington increased by $7,347, the largest absolute increase in the U.S. And between 2004 and 2011, Washington's absolute increase in wages—41.6%—was the largest increase in the U.S. (See **Appendix A** for list of sectors included in "ICT.")

Table 1. ICT Employment, 2002-2011

STATE	2011	Trend line growth 2002-2011[4]	Recent Minimum to 2011[5]
California	548,108	-1.6%	7,542
Texas	313,912	-0.9%	11,316
Virginia	200,167	1.3%	23,448
New York	185,826	-0.8%	7,462
Florida	176,488	-0.8%	1,671
Massachusetts	135,591	-1.0%	3,057
Illinois	130,790	-0.9%	2,009
Washington	***124,440***	***2.4%***	***22,830***
Georgia	120,770	-1.6%	-
New Jersey	119,425	-1.0%	809
U.S. TOTAL	***3,544,833***	***-0.7%***	***69,938***

Data source: U.S. Bureau of Labor Statistics, author's calculations.

Manufacturing. Overall, manufacturing employment in Washington has done much better than the U.S. average, though largely due to the upsurge in aerospace. Between 2004 and 2011, overall manufacturing employment grew 2.4%, the 2nd highest rate of growth in an industry that has been on the downturn in employment for years; excluding Alaska, Washington was the fastest growing, and far ahead of the largest manufacturing bases in 2004 (California, for instance, has lost 18.4% of its manufacturing workforce since 2004).

Between 2007 and 2011, the largest drivers of job growth within manufacturing in Washington came from transportation equipment, responsible for 75.9% of gross gains, beverage and tobacco product manufacturing (12.6%), and food manufacturing (9.3%). Transportation equipment added 4,300 jobs over this period, largely due to a ramp up in aerospace hiring. The biggest drags on employment came from wood products manufacturing (23.1%), furniture and related (12.3%), and computer and electronic products (11.4%).[6] Among these three subsectors (at the 3-digit NAICS level), a total of 13,000 jobs were lost over this period, compared with an addition of 5,540 jobs among the top three largest drivers of employment growth in manufacturing.

Life Sciences. The most report published by the Washington Biotechnology and Biomedical Association (WBBA) found that the life sciences industry employment in Washington grew nearly 9% between 2007 and 2011. The report found that the life sciences industry is the 5th largest employing sector in the state, and growing, with 33,519 direct jobs in 2011, while supporting (though estimated multiplier effects) as

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[4] Based on slope of natural log.

[5] The recent minimum varies by state, and refers to the lowest level of employment in the ICT by state in the past 10 years. For Washington and many others states, this employment nadir occurred after the end of dot.com bubble.

[6] We calculate gross contributions to either growth or contraction by the following: for employment level "y," industry "i" and year "t," if $(y_t - y_{t-1})_i > 0$, then contribution to gross gains $C^+ = (y_t - y_{t-1})_i / \sum_{i=1}^{n} (y_t - y_{t-1})_i$ for all cases when $(y_t - y_{t-1})_i > 0$. Calculation for contribution to gross losses is simply the sum of cases when $(y_t - y_{t-1})_i < 0$.

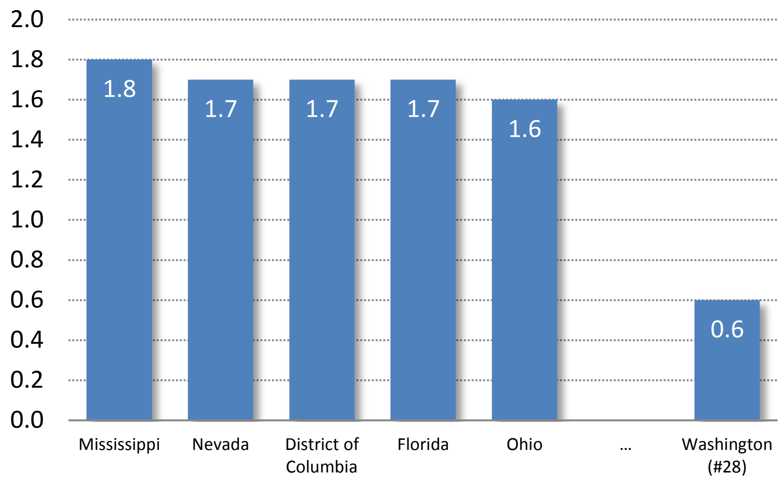
many as 57,000 additional jobs across the state. The report also estimated the sector contributes $10.4 billion in state GDP, including $6.6 billion in personal income, while average wages in 2011 were $77,490, compared with the state private sector annual wage average of $48.519.[7]

Between 2007 and 2011, research and development in biotechnology was the largest driver of employment growth, growing 53.3% and contributing 46.2% of all employment gains in the sector during this period. In fact, over this period, job gains in this subsector in Washington constituted 29% of all research and development in biotechnology across the U.S. (and while Washington grew 53.3%, national subsector employment grew at only 1.7%). Other major drivers included biological product manufacturing (22.1% of all gains) and ophthalmic goods manufacturing (17.4% of all gains).

[7] Washington Research Council, "Trends in Washington's Life Sciences Industry, 2007-2011," report published for the Washington Biotechnology and Biomedical Association, 2012.

Unemployment

Figure 5. Unemployment Rates by State
Largest reductions in rate, year-over-year, August 2012 (ppts)



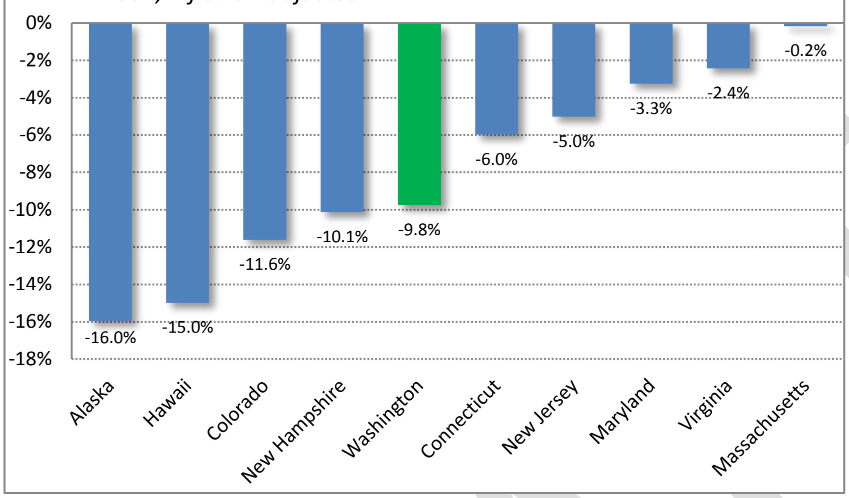
Why this metric matters?
Unemployment is an imperfect measure, in that it only counts the rate of employment among active participants in the labor force. It therefore does not factor in underemployment and excludes those that have exited the labor force due to discouragement. Nonetheless, changes in this measure do roughly approximate the changes in labor markets and serve as a useful gauge for the health of a state economy.

Data source: U.S. Bureau of Labor Statistics.

How has Washington performed? Unemployment in Washington has remained one of the highest in the U.S., with a seasonally adjusted rate of 8.6% in August 2012, 36th highest in the U.S. Washington did slightly better against other states in its reduction in unemployment—between August 2011 and August 2012, the state's unemployment rate fell 0.6 percentage points, 28th best over the period (**Figure 5**). (However, we again caution that unemployment rate estimates often have a sizable margin of error, and are subject to a variety of factors, e.g., the exit and re-entry of laid off workers back into the workforce.)

Income

Figure 6. Change in Median Household Income, 2007-2011
Among top highest median household income states in 2007, inflation-adjusted



Why this metric matters? Income is a key measure of economic well-being because it reflects the economic performance and overall standard of living for middle-income households.

Data source: U.S. Census Bureau.

How has Washington performed? Between 2007 and 2011, Washington's median household income fell 9.8%, the fifth largest decline among the ten wealthiest states by this measure in 2007 (**Figure 6**).

Among the top ten wealthiest middle income states in 2007, Massachusetts saw the smallest absolute decline (-0.2%), while Alaska and Hawaii had overall reductions of 16% and 15%, respectively. The largest year-over-year decline for Washington during this period was between 2009 and 2010, when median household income fell 8.5%; between 2010 and 2011, income fell 1.9%.

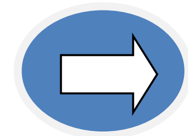
Personal income, which includes wage and salary earnings plus interest, dividends, and other non-wage income sources, grew (in nominal terms, i.e., unadjusted for inflation) at approximately 4.1% between 1990 and 2011,[8] only twenty-fourth highest among all 50 states plus Washington D.C. However, we can disaggregate this data by income source and industry. For instance, roughly 12.1% of non-farm private sector earnings came from manufacturing in 2010, of which 9.1% came from durable goods production (though this is down from 15.6% in 2001 and 2002). The information sector, which includes software publishing, contributed 8.3% of all wage and salary earnings in 2010, though this was down from 10.6% in 2002.

The composition of earnings in Washington's economy stands out uniquely from other states, notably in the large role of the tech sector. Taking the average wage and salary earnings by macro sector from 2001 to 2010, Washington's total earnings in the information sector ranked fourth among all fifty states plus Washington D.C. Moreover, the share of these earnings out of total non-farm earnings ranked

[8] Based on slope of natural log of annual per capita personal income, from 1990 to 2011.

Washington first, at 7.13% ahead of Colorado (7.05%) and New York (5.54%). Over the recessionary period 2008 through 2010, approximately 19.6% of all personal income earned in Washington came in the form of interest, dividend, and rent payments, the eighth highest in the U.S. (just ahead of California, but well below Florida, at 25.9%); the U.S. average over this period was 17.6%.

V. Talent & Human Capital



Public School Test Scores

Table 2. Change in Percentage of Washington Public School Students Reaching Basic and Proficient Levels of Math and Reading, 2007-2011

Level	Cohort and Subject	Percentage, 2011	Rank	Change, 2007-2011 (percentage points)	WA Rank
Basic or above	4th grade math	84%	24	-1.0	33
	8th grade math	76%	21	1.0	30
	4th grade reading	67%	31	-3.5	49
	8th grade reading	77%	26	0.3	38
Proficient or above	4th grade math	45%	13	1.0	23
	8th grade math	40%	12	4.0	17
	4th grade reading	34%	20	-1.9	48
	8th grade reading	37%	13	2.9	23

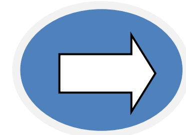
Why this metric matters? Test scores, while imperfect, reflect proficiency levels in a way that allows for state-by-state comparisons. Washington's performance against other states, both for scores in one year but also changes over time, reflect on the capacity of our state to education our youth and prepare them for post-secondary education.

Data Source: *U.S. National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009 Mathematics and Reading Assessments.*

How has Washington performed? In 2011 (most recently available data), Washington ranked 24th in 21st in percentage of students in 4th and 8th grade, respectively, scoring at or above "basic level" in math, and 31st and 26th at or above "basic level" in reading. Based on the percentage of public school students scoring at or above "proficient," Washington ranked 13th and 12th in math and 20th and 13th in reading among 4th and 8th graders, respectively.

We also look at how Washington has improved in percentage of students meeting or exceeding each threshold between 2007 and 2011. Washington saw essentially no change in the percentage of 4th and 8th grade students in scoring at or above basic in math. However, there was a 4 percentage point increase in percentage of 8th grade students at or above "proficient" in math. The largest negative change between 2007 and 2011 occurred among 4th graders, with a 3.5 percentage point decline in percentage of students at or above basic reading.

Educational Attainment



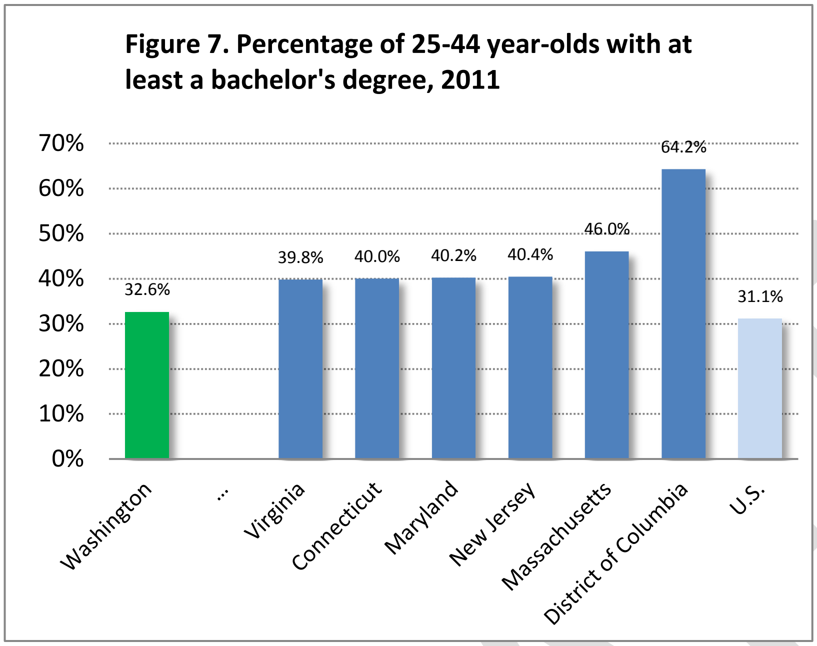


Figure 7. Percentage of 25-44 year-olds with at least a bachelor's degree, 2011

Why this metric matters? Labor supply is often a critical determinant for whether a business can locate and/or grow in a region. Supply of skilled workers is a function of both in-migration and a region's capacity to educate its resident population (the education "pipeline"). Educational attainment reflects both these factors, and an absolute and/or relative decline is cause for serious concern about the future economic prospects of Washington.

Data Source: *U.S. Census Bureau, American Community Survey.*

How has Washington performed? In 2011, Washington ranked 18th among all fifty states and the District of Columbia in the share of its 25-44 year old population with at least a bachelor's degree (32.6%; **Figure 7**). Excluding the District of Columbia (an outlier with 64.2% of its resident 25-44 population with at least a bachelor's degree), Washington was 13.4 percentage points behind state leader Massachusetts (46.0%) and 7.8 percentage points behind New Jersey (second highest). Since 2006, Washington has also been slow in improving this metric, growing at a trend line rate of only 0.9%, good for only 45th among all fifty states and the District of Columbia.[9]

Washington ranks even lower for share of the 25 to 44 age cohort with at least a high school diploma or GED (89.9%, good for 25th). Washington's rate is 5 percentage points below the highest performing state, North Dakota (94.8%), and 1.9 percentage points behind Massachusetts.

[9] Based on the slope of the natural log for these years.

STEM and High Skilled Workers

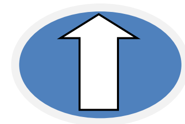


Figure 8. Location Quotient for STEM Workforce, 2011

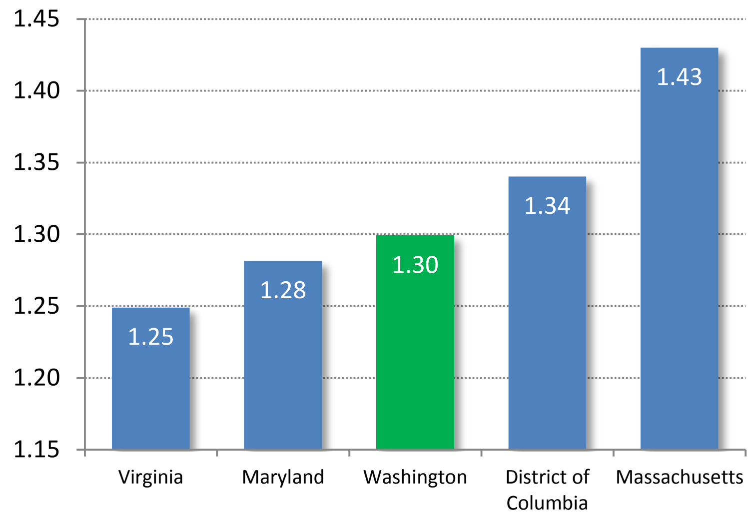
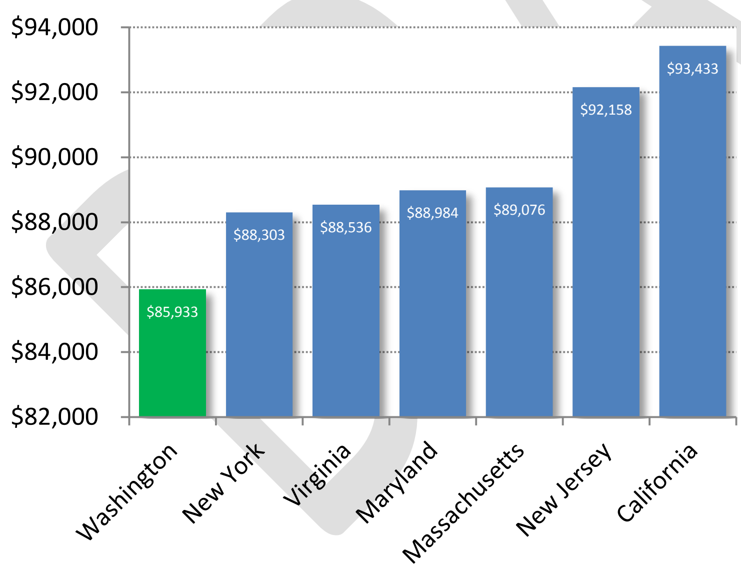


Figure 9. Average STEM Annual Wages, 2011



Why this metric matters? The availability of STEM workers is critical to continued expansion and growth of tech industries and innovation-based activities in Washington. An occupational mix that includes a high concentration of skilled workers reflects both growth in high-paying industries and a labor supply amicable to new tech-oriented investments.

Workers with STEM skills (science, technology, engineering, and mathematics) are a key input in activities like research & design, prototyping, analytics, and business processes. Importantly, STEM workers earn well above the national average: the latest occupational data for the U.S. shows that STEM workers in 2011 made on a weighted average $81,212 per year, compared with the national average of just $45,230 and national median annual earnings of $34,460. In Washington, STEM occupations earned on average $85,933 per year in 2011, compared with a statewide overall average of $50,280.

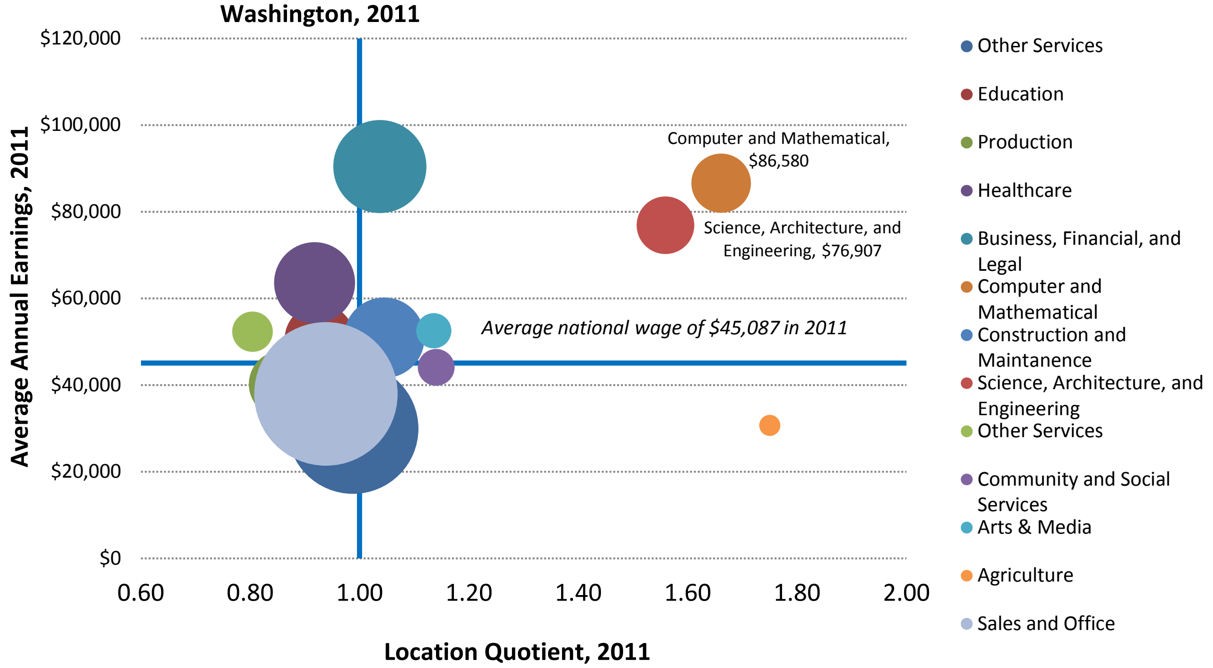
STEM occupations are also concentrated in, and help drive, some of the leading sectors in our state, in such areas as the life sciences, information & communication technology, clean energy, aerospace, and advanced manufacturing fields. For instance, in 2011 STEM occupations made up roughly 15% of the information sector workforce nationally, but earned on average 47.7% more than non-STEM workers within the industry.

Data Source: *U.S. Bureau of Labor Statistics (BLS), 2011. See **Appendix B** for list of occupations included in STEM definition.*

How has Washington performed? In 2011, Washington ranked third among all fifty states and the District of Columbia in workforce concentration in STEM occupations, at 11.9%—30% higher than the national average (**Figure 8**). Washington ranked eighth in (weighted) annual earnings in STEM fields, at $85,933 (**Figure 9**). Washington's largest STEM occupation by number of workers was in "software developers, applications" (33,970), followed by "software developers, systems software" (14,820), civil engineers (12,560), and computer systems analysts (12,520). Among Washington's top ten largest occupations by workforce size, the highest location quotient was in aerospace engineers, with a workforce concentration 4.61 times the national average. Also among the top largest occupations, computer and information systems managers led with an average annual wage of $130,520, followed by systems software developers ($102,440).

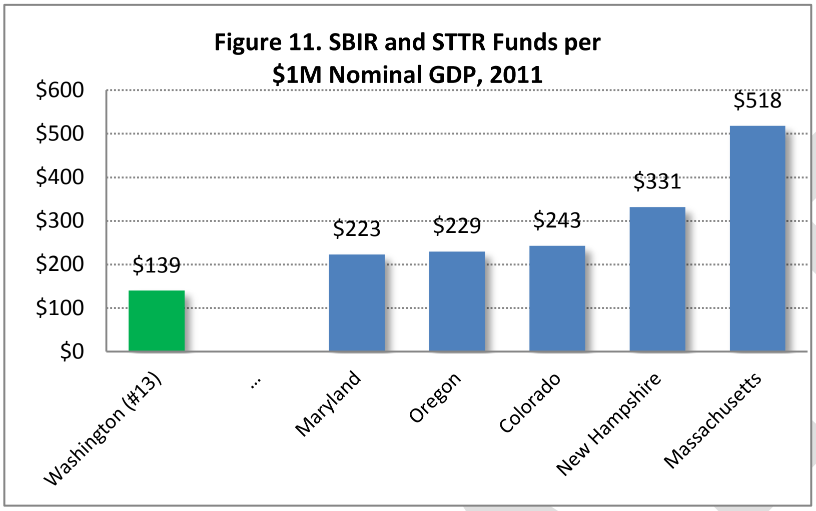
Using a broader, aggregated set of occupational categories, Washington is nearly 66% more concentrated than the national average in computer and mathematical occupations, and 56% more concentrated in science, architecture, and engineering fields. These occupations are both large and pay well—in 2011 average wages were $86,580 and $76,907, respectively, compared with a national average of $45,087 (**Figure 10**).

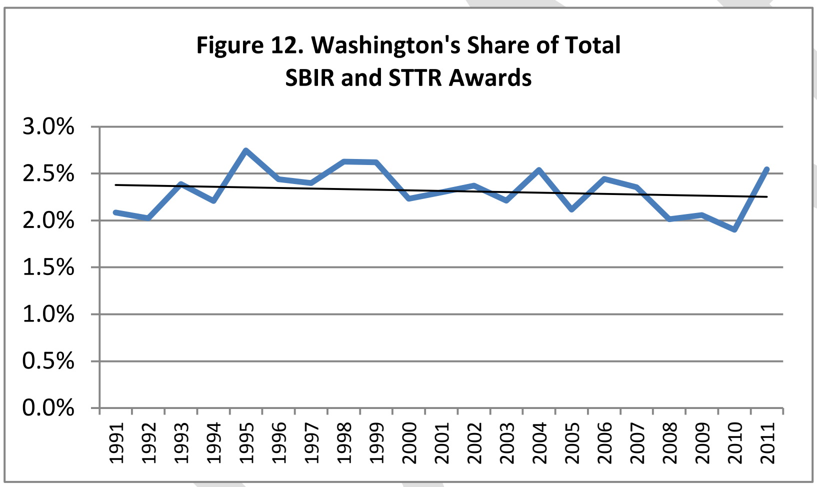
Figure 10. Occupations by Employment Concentration and Annual Pay, Washington, 2011



VI. Entrepreneurship and Small Business

SBIR and STTR





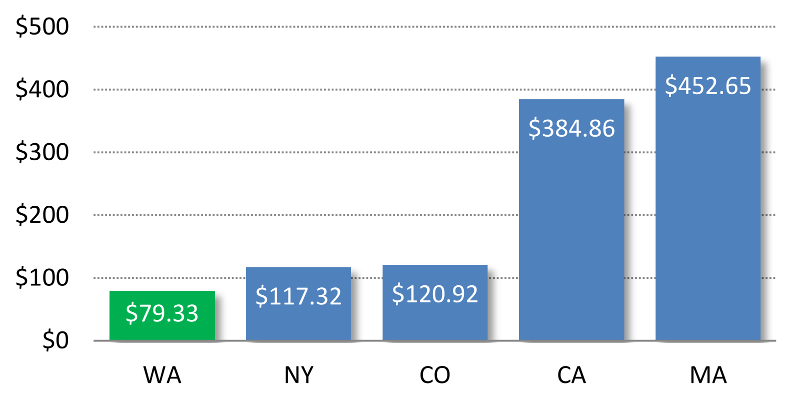
Why this metric matters? SBIR and STTR funds provide critical early stage capital for start-ups to design and build prototypes and commercialize university and federal laboratory-based discoveries. Both programs encourage smaller businesses to engage in commercialization-oriented R&D in critical areas of innovation. The amount of funds invested in Washington may reflect the state's ability to generate exciting new areas of research and/or the degree to which supporting institutions have increased the ability of participating businesses in the state to apply for awards.

Data Source: *U.S. Small Business Administration, Office of Technology; U.S. Bureau of Economic Analysis (BEA).*

How has Washington performed? In 2011, Washington ranked 13th among all fifty states in dollar amount of awards per $1 million in nominal GDP, but only 27% the level of Massachusetts. At $139.3 per $1 million of nominal GDP, Washington's rate in 2011 is well below the state's peak of $228 million in 2004. Between 2000 and 2011, Washington has at its worst ranked 21st in attracting both types of awards. In terms of total award dollars, Washington ranked 7th in 2011 in phase I grants and 12th for phase II. In 2011 Washington was more competitive in attracting STTR grants, ranking 6th in amount of awards (all phases). In terms of total awards, Washington share has remained relatively stable since 1991.

Venture Capital Investment

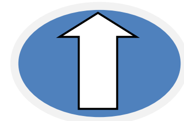
Figure 13. Per capita Venture Capital Investments, 2011



Why this metric matters? Venture capital has long been a critical early driver and enabling of innovation. In recent years concerns have been raised over the retreat of venture capital from early stage prototyping and commercialization—the often cited "valley of death." The recent financial crisis and recession have also impacted the availability of private capital to support start-ups. A decline in this financial support could translate into a weaker innovation eco-system and decline in new products to market.

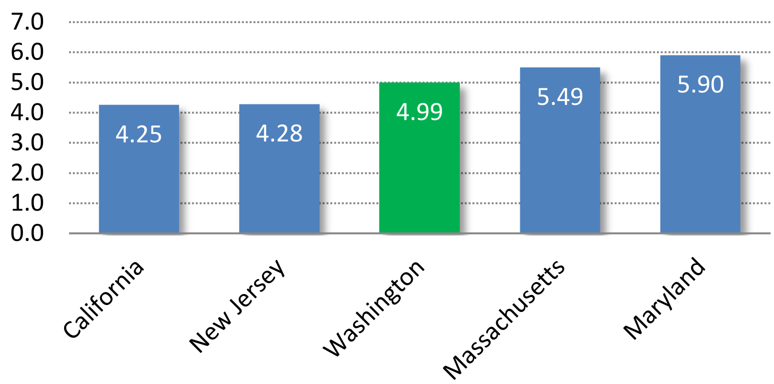
Data Sources: *National Venture Capital Association, U.S. Census Bureau.*

How has Washington performed? In 2011, Washington saw more than $79 per capita in venture capital investment—good for 5th highest in the U.S., though well below Massachusetts ($452.65 per resident) and California ($384.86). Washington's per capita VC rate also declined from 2010 by $11.85 per resident, or 13%. The state's five year change in per capital VC investments was also negative, contracting by $83.16, or more than 51%, and down more than 59% since a recent peak in 2006. Overall volume of VC dollars also declined year-over-year in 2011, from $613.2 million to $541.8 million (a 11.6% drop). Since the most recent annual peak of $1.26 billion (in 2007), VC dollars per year have fallen 57%.



Investment in R&D

Figure 14. Total R&D as Percentage of State GDP, 2008
Among top ten states for total R&D

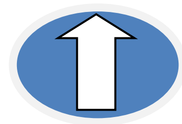


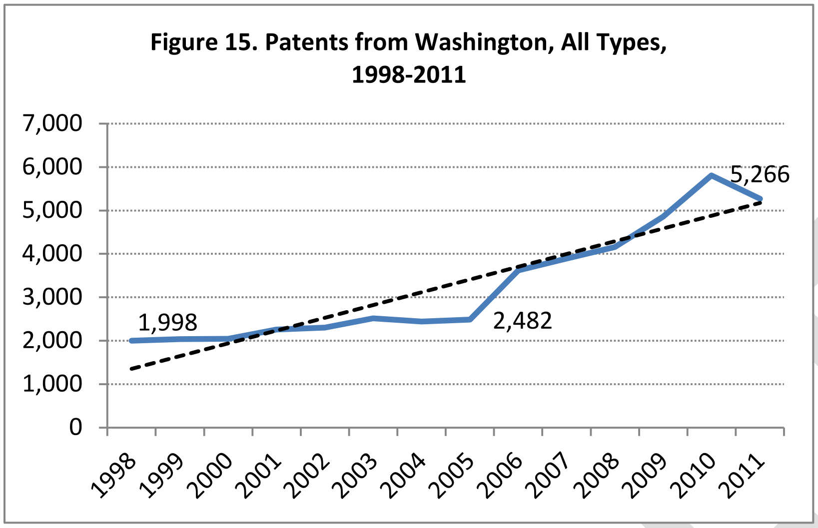
Why this metric matters? R&D is often high risk, but is widely understood to be a public good with broad, positive externalities and spillover effects across the economy.

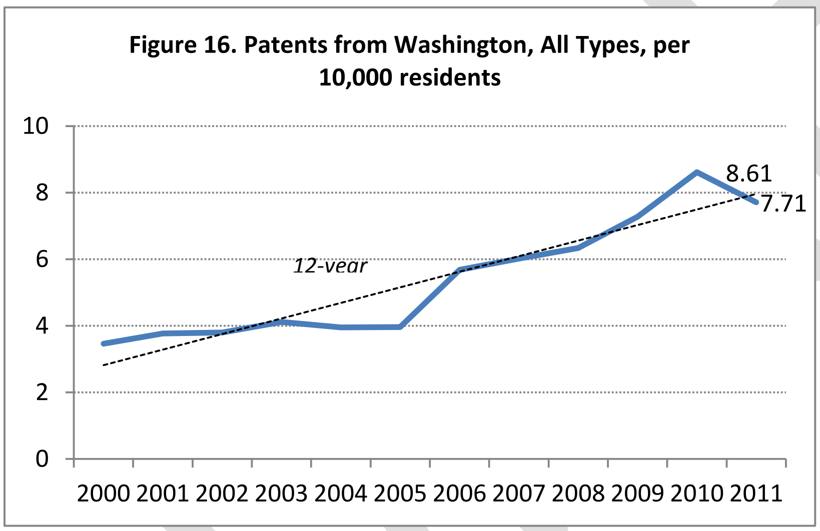
Data Sources: *Census Bureau, special tabulations (2011) of 1989–2008 Business Information Tracking Series via NSF Science and Engineering Indicators 2012.*

How has Washington performed? Based on the most recent data (2008), among the top ten states for total R&D expenditures, Washington ranked 3rd in R&D as a percentage of gross state product (GSP). Between 2002 and 2008, Washington grew at a trend line rate of 4.9%. R&D spent as a percentage of GSP in 2008 was also the highest among all years reported (going back to 1991), and increased 0.36 percentage points between 2007 and 2008. In terms of total R&D expenditures, Washington ranked 6th with nearly $17 billion, behind Massachusetts ($21.0 billion), Texas ($20.3 billion), New Jersey ($20.7 billion), and California ($81.3 billion). From 2002 to 2008, Washington's overall R&D expenditures grew at a trend line rate of 7.7% per year, behind only Massachusetts (7.8%) among states with the highest volumes of R&D in 2002.

Patents







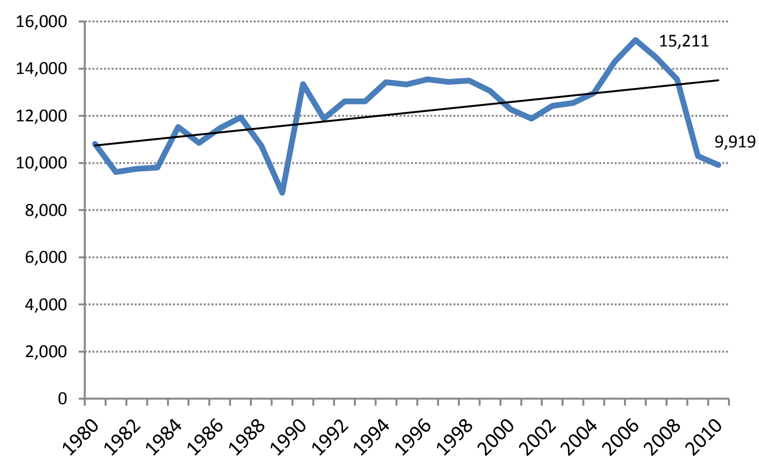
Why this metric matters? Patents are of particular importance for R&D-intensive industries. While an imperfect measure, patent data do help proxy the level of innovation occurring both in companies and research institutions—high levels of patenting reflect significant investments in R&D, and provide the basic protections from which technologies can ultimately become commercialized.

Data Sources: *U.S. Trademark and Patent Office; U.S. Census Bureau.*

How has Washington performed? Washington has shown the strongest growth among all 50 states and the District of Columbia over the 1998 to 2011 period, as measured in total patents (all types) and on a per capita basis. During this period, Washington led all states in patent production both on a trend line basis (8.8%, more than double the rate of runner-up Oregon and nearly three times as fast as Massachusetts) and on a per annum basis (7.7%). Washington also led the way on a per capita basis (patents per 10,000 residents) between 2000 and 2011, with trend line growth of 8.6% and per annum growth of 7.5%. As a result, Washington has been quickly moving up the rankings by both measures—between 2000 and 2011, the state has moved up 14 positions for per capita patents, from #19 to #5, and eight spots for total patents between 1998 and 2011 (from #13 to #5).

Start-ups

Figure 17. Start-ups with Employment in Washington, 1980-2010



Why this metric matters? The rate of new business creation reflects many factors, including the degree to which a state's business environment is conducive to and supports entrepreneurialism. The data presented below is not incomplete, since it does not capture sole proprietorships, but still tells a useful story about when and where start-up rates have been fastest. Data reflect the number of new businesses—less than a year old—in any given year.

Data Sources: *U.S. Census Bureau, Business Dynamics Statistics.*

How has Washington performed? Like many other states, Washington has seen a sizable drop in new start-ups, particularly since its peak level in 2006 (when 17,582 new firms were formed). In 2010—the latest data available—9,919 firms were created, approximately 34.8% below 2006—35th among all fifty states and the District of Columbia.

VII. Infrastructure

Transportation System

Table 3. System Metrics

Infrastructure Metrics	State Ranking (year)[10]
Percent functionally obsolete bridges	41 (2011)
Percent structurally deficient bridges	6 (2011)
Vehicle miles traveled per capita (resident)	11 (2010)
Roads in good or very good condition	16 (2009)

Why this metric matters? Infrastructure underpins economic activities in a regional economy. Reliable transportation systems help reduce logistics and shipping costs for businesses and help commuters save on fuel and related expenditures, some of which can be reallocated to other consumption activities.

Data Source: Federal Highway Administration and Bureau of Transportation Statistics.

How has Washington performed? Meaningful data on infrastructure is hard to locate. However, based on available data Washington ranks well compared to other states in its share of bridges deemed structurally obsolete (sixth lowest share) and 11th lowest in vehicle miles traveled per resident. However, we rank 41st for functional obsolete bridges and 16th for roads that are in “good” or “very good” condition.

[10] Rankings in ascending order. For example, Washington had the 6th lowest percentage of its bridges deemed “structurally deficient” in 2011.

VIII. International Business

Inbound Foreign Direct Investment

Figure 18. Total Number of Workers in Majority Foreign-owned U.S. Affiliates, 2009 (1000s of workers)

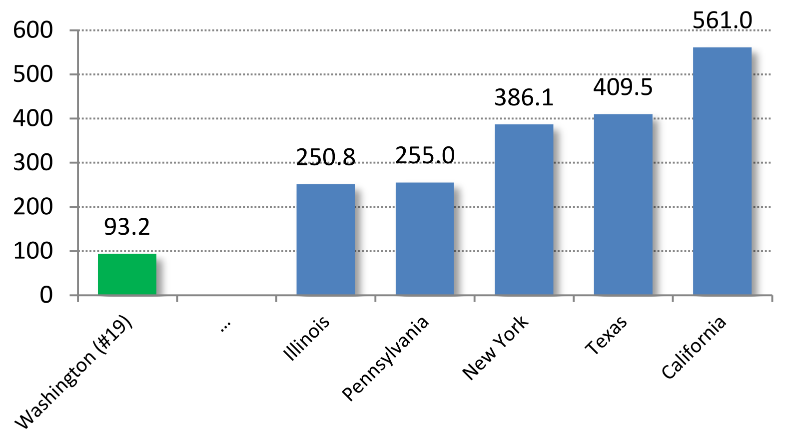
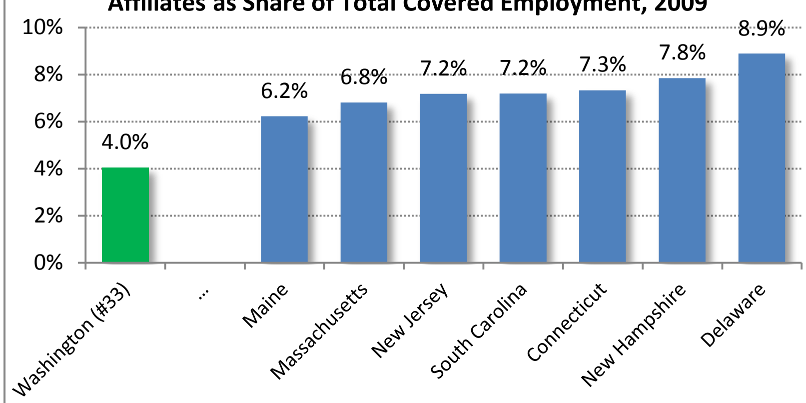


Figure 19. Workers in Majority Foreign-owned U.S. Affiliates as Share of Total Covered Employment, 2009



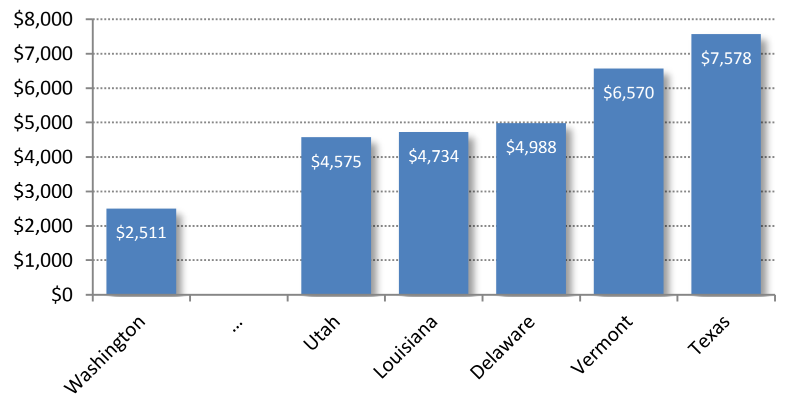
Why this metric matters? High levels of foreign direct investment indicate an economy that is strongly tied in with other regions in the global economy. FDI at the state level refers to the level of either physical or capital investment in a state by foreign firms. This investment is often referenced by the level of employment attributed to FDI. However, we caution that this metric can also reflect accounting decisions that arbitrage variation in tax laws and systems across states, and may not reflect more robust economic activity.

Data Sources: *the Bureau of Economic Analysis (BEA) measures the nature and level of FDI among U.S. States as part of the Survey of Current Business; Bureau of Labor Statistics Census of Employment and Wages.*

How has Washington performed? For the most recent year for which data is available, Washington ranked 19th in total number of workers employed in majority foreign-owned U.S.-affiliates (both bank and non-bank operations), with approximately 93,200 workers. This was a slight decline from 2008, when 93,900 workers were employed in foreign firms, though well above 2007 (when 90,500 workers were employed). As a share of total covered employment in the state, Washington ranked 33rd in 2009 (4.0%), well below Delaware (8.9%), New Hampshire (7.8%), and Connecticut (7.3%).

Exports

Figure 20. Non-aerospace, Non-agriculture Exports per Capita, 2011



Why this metric matters? Exports are a key driver of economic development. More export sales translate into more income from external sources flowing into a region. An increase in exports also reflects greater diversity to hedge against business cycles and economic downturns in the U.S. We look at exports minus aerospace and agriculture for the following reasons: 1) U.S. Customs data defines the origin of an exported good to include where it is consolidated, crediting Washington with several commodity goods (e.g., soy beans) that are not produced here. This issue is widespread across many states with large ports, making correcting the issue not feasible; 2) aerospace sales reflect broader swings in the industry that are beyond the influence of policymakers at the state level, whereas remaining exports might be more responsive to efforts of state policymakers; and 3) in the case of aerospace, much of the value attributed to Washington may in fact originate elsewhere, e.g., the value of an aircraft sale attributable to the value of the installed engines sourced from either Ohio or the United Kingdom. This data also does not capture services exports, and thus omits the vast majority of Microsoft sales that come in the form of licensing, as well as many other important, tradable activities across the state.

Data Sources: *WISER Trade, based on U.S. Customs data; U.S. Census Bureau.*

How has Washington performed? In 2011, Washington exported $22.4 billion in goods other than aerospace and agricultural products, 17th most among the fifty states. Washington's overall trend line growth in these exports has been 6.5% between 1996 and 2011, 25th best in the U.S., though 9th best among the top 20 states for exports of this segment of goods. Washington's growth was similar on a per capita basis (6.4% between 2000 and 2011).

IX. Conclusion: Where we do well, and where we need improvement

Washington has long been strong in the supply of skilled workers, international connectivity through exports, and innovation as measured by patenting activity and R&D investments. However, to what extent are these intermediate outcomes the result of state policy, versus “random events” delinked from policy choices? A common theme throughout these metrics is that Washington has not sufficiently grown the local stock of necessary inputs. Much of our state’s success owes to the growth of local businesses and the attractiveness of our region for entrepreneurs and skilled workers. We are highly concentrated in STEM-based occupations and skilled workers, but only a fraction of these workers received the training they needed from Washington-based institutions.

X. Appendix

Appendix A. Sectors Included in "Information and Communication Technology"

NAICS	Description
333295	Semiconductor Machinery Manufacturing
334111	Electronic Computer Manufacturing
334112	Computer Storage Device Manufacturing
334113	Computer Terminal Manufacturing
334119	Other Computer Peripheral Equipment Manufacturing
334210	Telephone Apparatus Manufacturing
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing
334290	Other Communications Equipment Manufacturing
334310	Audio and Video Equipment Manufacturing
334411	Electron Tube Manufacturing
334412	Bare Printed Circuit Board Manufacturing
334413	Semiconductor and Related Device Manufacturing
334414	Electronic Capacitor Manufacturing
334415	Electronic Resistor Manufacturing
334416	Electronic Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
334419	Other Electronic Component Manufacturing
335921	Fiber Optic Cable Manufacturing
511210	Software Publishers
517	Telecom
518	Internet Service Providers, Web Search Portals, and Data Processing Services
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541513	Computer Facilities Management Services
541519	Other Computer Related Services
611420	Computer Training

Appendix B. STEM Occupations

OCC_CODE	OCC_TITLE		
11-3021	Computer and Information Systems Managers	17-3027	Mechanical Engineering Technicians
11-9041	Architectural and Engineering Managers	17-3029	Engineering Technicians, Except Drafters, All Other
11-9111	Medical and Health Services Managers	17-3031	Surveying and Mapping Technicians
11-9121	Natural Sciences Managers	19-1013	Soil and Plant Scientists
15-1111	Computer and Information Research Scientists	19-1022	Microbiologists
15-1121	Computer Systems Analysts	19-1029	Biological Scientists, All Other
15-1131	Computer Programmers	19-1031	Conservation Scientists
15-1132	Software Developers, Applications	19-1032	Foresters
15-1133	Software Developers, Systems Software	19-1041	Epidemiologists
15-1141	Database Administrators	19-1042	Medical Scientists, Except Epidemiologists
15-1142	Network and Computer Systems Administrators*	19-2012	Physicists
15-2011	Actuaries	19-2021	Atmospheric and Space Scientists
15-2021	Mathematicians	19-2031	Chemists
15-2031	Operations Research Analysts	19-2032	Materials Scientists
15-2041	Statisticians	19-2041	Environmental Scientists and Specialists, Including Health
17-1011	Architects, Except Landscape and Naval	19-2042	Geoscientists, Except Hydrologists and Geographers
17-1012	Landscape Architects	19-3011	Economists
17-1021	Cartographers and Photogrammetrists	19-3022	Survey Researchers
17-1022	Surveyors	19-3031	Clinical, Counseling, and School Psychologists
17-2011	Aerospace Engineers	19-3039	Psychologists, All Other
17-2041	Chemical Engineers	19-3051	Urban and Regional Planners
17-2051	Civil Engineers	19-3091	Anthropologists and Archeologists
17-2061	Computer Hardware Engineers	19-3099	Social Scientists and Related Workers, All Other
17-2071	Electrical Engineers	19-4011	Agricultural and Food Science Technicians
17-2072	Electronics Engineers, Except Computer	19-4021	Biological Technicians
17-2081	Environmental Engineers	19-4031	Chemical Technicians
17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	19-4041	Geological and Petroleum Technicians
17-2112	Industrial Engineers	19-4051	Nuclear Technicians
17-2121	Marine Engineers and Naval Architects	19-4091	Environmental Science and Protection Technicians, Including Health
17-2131	Materials Engineers	19-4092	Forensic Science Technicians
17-2141	Mechanical Engineers	19-4093	Forest and Conservation Technicians
17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	19-4099	Life, Physical, and Social Science Technicians, All Other
17-2171	Petroleum Engineers	25-1021	Computer Science Teachers, Postsecondary
17-2199	Engineers, All Other	25-1022	Mathematical Science Teachers, Postsecondary
17-3011	Architectural and Civil Drafters	25-1031	Architecture Teachers, Postsecondary
17-3012	Electrical and Electronics Drafters	25-1032	Engineering Teachers, Postsecondary
17-3013	Mechanical Drafters	25-1041	Agricultural Sciences Teachers, Postsecondary
17-3019	Drafters, All Other	25-1042	Biological Science Teachers, Postsecondary
17-3021	Aerospace Engineering and Operations Technicians	25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary
17-3022	Civil Engineering Technicians	25-1052	Chemistry Teachers, Postsecondary
17-3023	Electrical and Electronics Engineering Technicians	25-1054	Physics Teachers, Postsecondary
17-3024	Electro-Mechanical Technicians	25-1063	Economics Teachers, Postsecondary
17-3025	Environmental Engineering Technicians	25-1064	Geography Teachers, Postsecondary
17-3026	Industrial Engineering Technicians		

25-1065	Political Science Teachers, Postsecondary	29-2052	Pharmacy Technicians
25-1066	Psychology Teachers, Postsecondary	29-2053	Psychiatric Technicians
25-1067	Sociology Teachers, Postsecondary	29-2054	Respiratory Therapy Technicians
25-1071	Health Specialties Teachers, Postsecondary	29-2055	Surgical Technologists
25-1072	Nursing Instructors and Teachers, Postsecondary	29-2056	Veterinary Technologists and Technicians
29-1011	Chiropractors	29-2061	Licensed Practical and Licensed Vocational Nurses
29-1021	Dentists, General	29-2071	Medical Records and Health Information Technicians
29-1023	Orthodontists	29-2081	Opticians, Dispensing
29-1029	Dentists, All Other Specialists	29-2091	Orthotists and Prosthetists
29-1031	Dietitians and Nutritionists	29-9011	Occupational Health and Safety Specialists
29-1041	Optometrists	29-9012	Occupational Health and Safety Technicians
29-1051	Pharmacists	29-9091	Athletic Trainers
29-1061	Anesthesiologists	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
29-1062	Family and General Practitioners	41-9031	Sales Engineers
29-1063	Internists, General	17-2031	Biomedical Engineers
29-1064	Obstetricians and Gynecologists	19-1023	Zoologists and Wildlife Biologists
29-1065	Pediatricians, General	19-1099	Life Scientists, All Other
29-1066	Psychiatrists	19-2043	Hydrologists
29-1067	Surgeons	19-2099	Physical Scientists, All Other
29-1069	Physicians and Surgeons, All Other	19-4061	Social Science Research Assistants
29-1071	Physician Assistants	25-1069	Social Sciences Teachers, Postsecondary, All Other
29-1081	Podiatrists	29-1199	Health Diagnosing and Treating Practitioners, All Other
29-1122	Occupational Therapists	19-1012	Food Scientists and Technologists
29-1123	Physical Therapists	19-1021	Biochemists and Biophysicists
29-1124	Radiation Therapists	19-2011	Astronomers
29-1125	Recreational Therapists	19-3041	Sociologists
29-1126	Respiratory Therapists	19-3092	Geographers
29-1127	Speech-Language Pathologists	25-1043	Forestry and Conservation Science Teachers, Postsecondary
29-1128	Therapists, All Other*	25-1053	Environmental Science Teachers, Postsecondary
29-1131	Veterinarians	25-1061	Anthropology and Archeology Teachers, Postsecondary
29-1181	Audiologists	25-1062	Area, Ethnic, and Cultural Studies Teachers, Postsecondary
29-2011	Medical and Clinical Laboratory Technologists	29-1022	Oral and Maxillofacial Surgeons
29-2012	Medical and Clinical Laboratory Technicians	19-1011	Animal Scientists
29-2021	Dental Hygienists	15-2091	Mathematical Technicians
29-2031	Cardiovascular Technologists and Technicians	15-2099	Mathematical Science Occupations, All Other
29-2032	Diagnostic Medical Sonographers	17-2021	Agricultural Engineers
29-2033	Nuclear Medicine Technologists	17-2161	Nuclear Engineers
29-2041	Emergency Medical Technicians and Paramedics	19-3094	Political Scientists
29-2051	Dietetic Technicians	19-3032	Industrial-Organizational Psychologists